

DERWENT-ACC-NO: 1975-F6422W

DERWENT-WEEK: 197522

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TITLE: File hole drilling and belling
appts. - has auger enclosed in casing rotating in
opposite direction

PATENT-ASSIGNEE: POBIHUSHCHY V[POBII]

PRIORITY-DATA: 1973CA-0184722 (October 31, 1973)

PATENT-FAMILY:

PUB-NO	PAGES	PUB-DATE	
LANGUAGE		MAIN-IPC	
CA 967770 A		May 20, 1975	N/A
000	N/A		

INT-CL (IPC): E02D000/01

ABSTRACTED-PUB-NO: CA 967770A

BASIC-ABSTRACT:

A planetary gear system (21) is provided adjacent to the upper side of the auger and bell forming wings (27) are provided adjacent the lower end (28) of the casing, the casing being cut away as indicated at (29) so that when the wings are closed, the wings being curved, form part of the lower end of the casing. Each wing is an arcuately curved portion having a downwardly extending or sloping surface (28), a relatively short vertical surface (29) and a curved base (30) and when closed, the vertical portion (29) terminates spaced from the corresponding vertical portion (31) of the casing which may extend outwardly slightly relative to the vertical portion (29) so that it acts as a relatively

short cutting tooth thus facilitating the cutting of the
sides of the drilling
when the auger is operating normally.

TITLE-TERMS: PILE HOLE DRILL BELL APPARATUS AUGER ENCLOSE
CASING ROTATING

OPPOSED DIRECTION

DERWENT-CLASS: Q42

⑪ ① **No. 967770**

④⑤ **ISSUED** May 20, 1975

⑤② **CLASS** 61-81
C.R. CL.

①⑨ ①①

CANADIAN PATENT

⑤④

PILE HOLE DRILLING AND BELLING APPARATUS

⑦⑦

Pobihushchy, Victor, Red Deer, Alberta, Canada

②①

APPLICATION No. 184,722

②②

FILED Oct. 31, 1973

③⑦

PRIORITY DATE

No. OF CLAIMS 8

ABSTRACT OF THE DISCLOSURE

Normally a hole for a pile is driven by an auger and then the base of the hole is belled out either by an adaptor on the base of the auger which is attached after the hole has been drilled or by a separate bellling tool. The present device is a combination auger and bellling tool. The auger is enclosed in a casing which rotates in the opposite direction to the auger. When the desired depth is reached, the lower part of the casing is moved outwardly gradually and the edges act as cutters gradually enlarging the base of the hole. As the auger continues to rotate, the cuttings are elevated to the surface.

BACKGROUND OF THE INVENTION

This invention relates to new and useful improvements in combination assemblies for drilling holes for piles and the like and belling the lower end thereof.

5 Conventionally, such assemblies consist of a vertically operated auger assembly within a derrick which forms the cylindrical pile drilling to the desired depth. An attachment is then secured to the lower end of the auger assembly for forming an enlarged bell at the base thereof, or alternatively, the auger assembly is disconnected from the derrick and a belling assembly is attached.

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Both methods suffer from several disadvantages, the principal one of which is the fact that the forming of a bell under the lower end of a building pile drilling is extremely slow and therefore expensive.

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SUMMARY OF THE INVENTION

The present invention overcomes the disadvantages inherent with conventional methods by providing a combination auger and belling assembly whereby the bell can be formed at the base of the pile drilling as soon as the drilling reaches the desired depth and without withdrawing the auger assembly from the drilling.

20



The principal object and essence of the invention is therefore to provide a device of the character herewithin described which includes bellings means formed on the lower end of the casing surrounding the auger assembly.

5 Another object of the invention is to provide a device of the character herewithin described in which the bellings means can be brought into operation as soon as the desired depth of drilling is reached.

10 Still another object of the invention is to provide a device of the character herewithin described in which the earth cuttings formed when the bell is formed, are elevated to the surface through the auger assembly.

15 A still further object of the invention is to provide a device of the character herewithin described which is simple in construction, economical in manufacture and otherwise well suited to the purpose for which it is designed.

20 With the foregoing objects in view, and other such objects and advantages as will become apparent to those skilled in the art to which this invention relates as this specification proceeds, my invention consists essentially in the arrangement and construction of parts all as hereinafter more particularly

described, reference being had to the accompanying drawings in which:-

BRIEF DESCRIPTION OF THE DRAWINGS:

5 Figure 1 is a cross sectional partially schematic view of the assembly.

Figure 2 is a partial section substantially along the lines 2-2 of Figure 1.

Figure 3 is a partial section substantially along the lines 3-3 of Figure 1.

10 Figure 4 is an enlarged fragmentary front elevation of the portion of the device showing one method of operating the hydraulic cylinder which in turn operates the bellwing.

Figure 5 is a cross sectional view substantially along the lines 5-5 of Figure 6.

15 Figure 6 is a view similar to Figure 1, but showing the bellwing in the expanded position.

In the drawings like characters of reference indicate corresponding parts in the different figures.

DETAILED DESCRIPTION

Proceeding therefore to describe the invention in detail, reference character 10 illustrates schematically, conventional derrick legs and guides normally used in pile drilling auger assemblies.

Also shown schematically is yoke 11 supporting main drive shaft 12 operated by a source of power shown schematically by reference character 13 and which may take the form of an hydraulic motor.

The auger assembly collectively designated 14 consists of an auger shaft 15 having an auger flight 16 secured thereto in the usual way and this auger shaft is connected to the drive shaft by means of a square pin coupling 17.

The lower end of the auger is provided with cutting teeth 18 to facilitate the cutting action when drilling holes or drilling for piles.

A cylindrical casing 19 surrounds the auger flight and extends the full length thereof, said casing having a cut-

away portion 20 at the upper end thereof acting as an exit for earth cuttings moved upwardly by the auger which, in this embodiment, rotates clockwise.

The casing 19 is adapted to rotate in a direction
5 opposite to that of the auger and in this connection a planetary gear system collectively designated 21 is provided adjacent the upper side of the auger. A sun gear 22 is secured to the drive shaft 12 and engages planetary gears 23 journaled for rotation upon pins 24 which in turn are held within a yoke or
10 frame 25 extending outwardly to the derrick guides 10 so that these guides prevent the frame from rotating, but permits same to be moved up and down with the entire assembly.

The planetary gears in turn engage an internal tooth ring gear 26 which is secured to the upper end of the casing so
15 that the casing rotates in a direction opposite to the auger. By adjusting the ratio or size of the gears making up the planetary system 21, the speed of rotation on the casing relative to the auger may be controlled and it is desirable that the speed of rotation be slower than the speed of rotation of the auger
20 assembly.

Bell forming wings collectively designated 27 are provided adjacent the lower end 28 of the casing, the casing

being cut away as indicated at 29 so that when the wings are closed, the wings being curved, form part of the lower end of the casing. In this embodiment, each wing is an arcuately curved portion having a downwardly extending or sloping surface 28, a relatively short vertical surface 29 and a curved base 30 and when closed, the vertical portion 29 terminates spaced from the corresponding vertical portion 31 of the casing which may extend outwardly slightly relative to the vertical portion 29 so that it acts as a relatively short cutting tooth thus facilitating the cutting of the sides of the drilling when the auger is operating normally.

Means are provided to mount these wings at the lower end of the casing, said means taking the form of a drive shaft 32 for each wing situated vertically and extending upwardly upon the inside of the casing 19. The wings are secured to the lower end of the drive shaft by a relatively long vertical side 33 and the drive shafts are journaled for partial rotation within the casing, by means of bearings 34 shown in Figure 5.

A relatively short crank arm 35 extends to one side of the upper ends 36 of the arms above the auger flight 16 and an hydraulic piston and cylinder assembly 37 is secured exteriorally of the casing adjacent the upper end thereof, being braced thereto by means of braces 38. The piston rod

39 of the piston and cylinder assembly is pivotally connected to the offstanding end of the crank arm 35.

Each hydraulic piston and cylinder assembly is provided with a pump 40 operatively connected thereto together with
5 an electric motor 41 and an hydraulic fluid reservoir 42.

Means are provided to control the operation of the motor 41 externally of the assembly and Figure 4 shows one such method.

The fixed frame 25 is provided with a pair of electrically conducting contact rings 43 operatively connected to
10 control means 44 which in turn may be connected to a source of electrical energy. Brushes 45 engage these rings as the assembly rotates thus conveying current to the motor via leads
46 so that the motor can be operated in either direction as
15 desired.

The diameter of the auger flight is less than the diameter of the casing and means are required in order to give bearing support to the auger assembly when rotating, particularly adjacent the lower end thereof. In this regard, a relatively short length of cylindrical piping or conduit 47 is se-
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cured to the inside of the casing 19 just above the upper ends of the wings 27, space being provided on each side to permit passage of the aforementioned drive shaft 32 so that in effect, this support conduit is in two halves.

5 The internal diameter of this support conduit is just slightly larger than the external diameter of the auger flight 16 and this internal diameter is of course slightly smaller than the distance between the two drive shafts 32. This gives rotative support to the auger assembly when in use.

10 In operation, the two wings are moved to the closed position whereupon the assembly engages the ground and the source of power 13 rotates the auger assembly and casing with the necessary downward pressure being supplied in the usual way.

 Earth cuttings are moved upwardly by the auger and
15 discharged through the exit aperture 20 until the desired depth of drilling is reached.

 At this time, the electric motors 41 are operated thus rotating drive shafts 32 and gradually opening the wings 27 so that the vertical portions 29 and diagonal portions 28 act as
20 coopers and gradually enlarge the base of the drilling formed

by the auger assembly. As the auger assembly is still rotating, but not descending, cuttings are fed to the auger assembly and elevated to the surface in the usual way.

When the desired diameter of belling has been formed,
5 the wings are closed whereupon the entire assembly may be moved to the surface in the usual way, it being understood that the bells as formed have a cross sectional configuration substantially equal to the profile of the wings when in the extended position, shown in Figure 6.

10 Since various modifications can be made in my invention as hereinabove described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departing from such spirit and scope, it is intended that all matter contained in the accompanying specification
15 shall be interpreted as illustrative only and not in a limiting sense.

WHAT I CLAIM AS MY INVENTION IS:-

(1) A combination drilling and belling assembly for use in forming belled drillings for building piles and the like, in which said assembly is mounted in a derrick for vertical up and down movement and in which a source of power is provided for rotating said assembly; said assembly comprising in combination an auger assembly including a shaft and a flight thereon, operatively connected to said source of power, a cylindrical casing within which said auger assembly rotates, excavated soil exit means through said casing at the upper end thereof, means to rotate said casing in a direction opposite to the direction of rotation of said auger, selectively operable bell-forming means on the lower end of said casing and means to selectively operate said bell-forming means.

(2) The assembly according to Claim 1 in which said means to rotate said casing in a direction opposite to said auger assembly includes a planetary gear system operatively connected between said auger shaft and said casing adjacent the upper end thereof.

(3) The assembly according to Claim 1 in which said bell-forming means includes at least one curved wing portion hinged adjacent the lower end of said casing and forming part thereof when in the closed position, the wall of said casing being cut away to receive said wing portion when said wing portion is in the aforementioned closed position.

(4) The assembly according to Claim 2 in which said bell-forming means includes at least one curved wing portion hinged adjacent the lower end of said casing and forming part thereof when in the closed position, the wall of said casing being cut away to receive said wing portion when said wing portion is in the aforementioned closed position.

(5) The assembly according to Claim 3 which includes means to mount said wing portion on the lower end of said casing, said means including a vertically situated drive shaft journaled for rotation upon said casing and extending from adjacent the upper end of said casing to adjacent the lower end thereof, bearing means mounting said shaft upon said casing, and a source of power for selectively rotating said shaft and hence opening and closing said wing portion relative to said casing.

(6) The assembly according to Claim 4 which includes means to mount said wing portion on the lower end of said casing, said means including a vertically situated drive shaft journaled for rotation upon said casing and extending from adjacent the upper end of said casing to adjacent the lower end thereof, bearing means mounting said shaft upon said casing, and a source of power for selectively rotating said shaft and hence opening and closing said wing portion relative to said casing.

(7) The assembly according to Claims 1, 2 or 3 which includes means within said casing for supporting said auger flight for rotation, therein, said last mentioned means including a relatively short cylindrical section within said casing, the inner diameter of which acts as a bearing sleeve for said auger flight intermediate the ends of said flight.

(8) The assembly according to Claims 4, 5 or 6 which includes means within said casing for supporting said auger flight for rotation therein, said last mentioned means including a relatively short cylindrical section within said casing, the inner diameter of which acts as a bearing sleeve for said auger flight intermediate the ends of said flight.



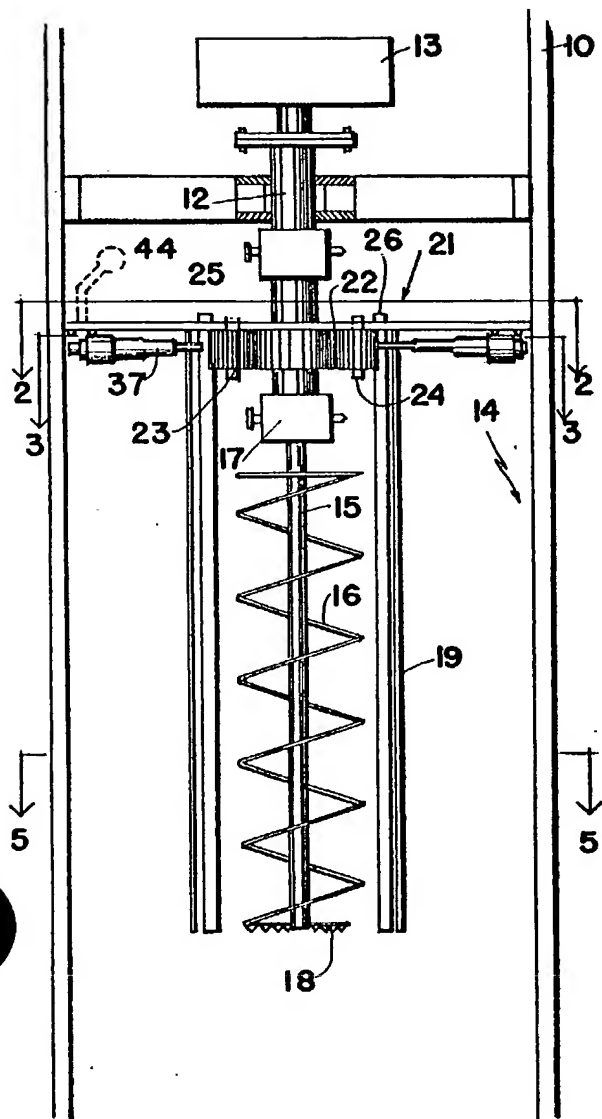


FIG. 1

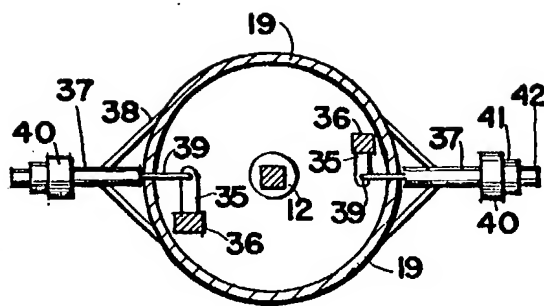


FIG. 3

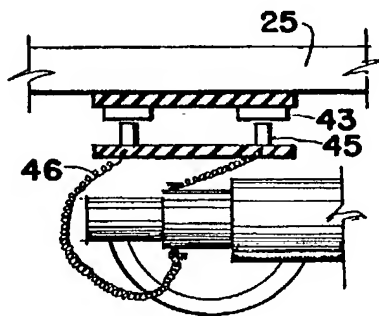


FIG. 4

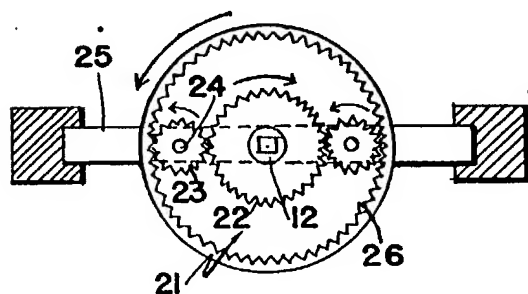


FIG. 2

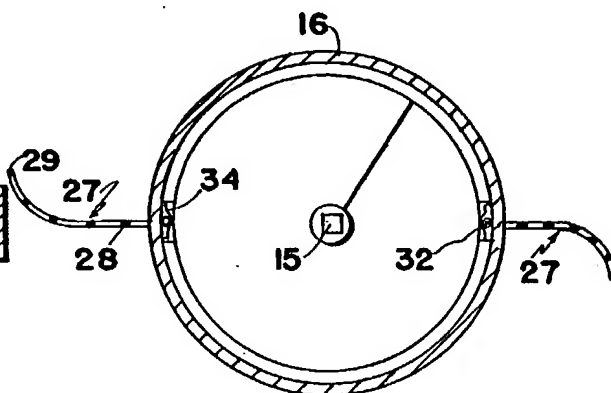


FIG. 5

INVENTOR
VICTOR POBIHUSHCHY
By
Errol C. Kent & Associates

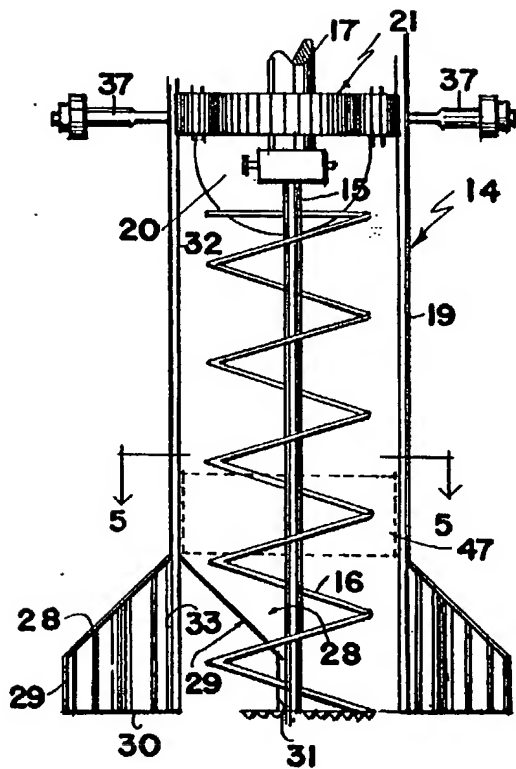


FIG. 6

INVENTOR

VICTOR POBIHUSHCHY

By

Errol L. Kent & Associates